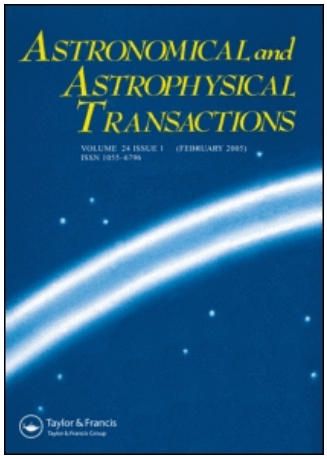

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Autocorrelation and Fourier analysis of the Crimean and Hipparcos photometry of the runaway star HD 192281

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New $B-V-R$ photoelectric photometry of the runaway star HD 192281 combined with Hipparcos observations of this star show a periodic brightness variation with a period of 67.385 days.

Keywords: Runaway stars; Photometry

HD 192281 = V2011 Cyg is a runaway star with the peculiar velocity $V_p = 67.8\,\mathrm{km\,s^{-1}}$ and with the significant height $z = 133$ pc above the Galactic plane [1]. The star belongs to the association Cyg OB8 [2], the place of its origin is considered to be IC 4996, and its kinematic age $\tau = (1.5 \pm 0.5) \times 10^6$ years [3]. According to Plaskett and Pearce [4], HD 192281 looks red for its spectral class O5(ef). Massey and Gronwall [5] have found an obscure colour effect which can probably be explained by interstellar reddening or polarization. HD 192281 is a rapidly rotating star with $V \sin i = 270\,\mathrm{km\,s^{-1}}$ [6].

Spectroscopic and photometric observations and an analysis of their periodicity have been made by Barannikov [7]. A periodic radial velocity variation with a period of 5.480 days and a semiamplitude $K \approx 16.8\,\mathrm{km\,s^{-1}}$ has been detected. On the basis of 39 measurements of the V light, which were made from October 1990 to July 1992, a periodic brightness variation has been detected with a quasiperiod of 9.59 days and an amplitude of about 0.04 m. However, there are no variations in brightness with the period of 5.480 days.

In the present paper the considerably dilated photometric observations of HD 192281, which have been carried out from October 1990 to August 2005 with the Zeiss-600 telescope at the Crimean Laboratory of the Sternberg Astronomical Institute using a photon-counting $B-V-R$ photoelectric photometer, are presented. The comparison star was HD 192660. The observations in V light were subjected to two forms of period analysis. The Crimean observations (106 data points) made by the present author combined with Hipparcos 130 data points [8] allowed the brightness variations to be detected by Scargle's [9] method, which is

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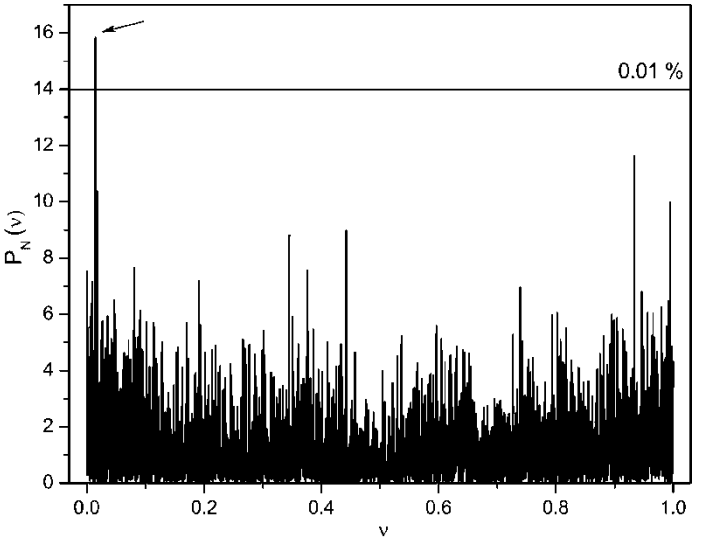

Figure 1. Fourier transformation of the Crimean and Hipparcos combined data. The highest peak is indicated by the arrow. The false alarm probability level 0.01% is also indicated.

a version of the Fourier method [10]. A Fourier analysis using Deeming's [11] method has given similar results. It should be noted that Hipparcos observations have been transformed to V using a table given by Otero [12]. Figure 1 shows the Fourier transform with the highest peak at the frequency corresponding to a period $P = 67.385$ days.

The present author used a form of autocorrelation analysis [13] to investigate the periodic variability of the V light of HD 192281. Figure 2 shows the self-correlation diagram for Crimean and Hipparcos combined data. There is minimum at about 65–70 days and maxima at lags of $0.5P$ and $1.5P$, which is in good agreement with the period $P = 67.385$ days found by Scargle's and Deeming's methods. Ground-based Crimean and satellite Hipparcos light curves against phases for a period of 67.385 days are shown in figure 3.

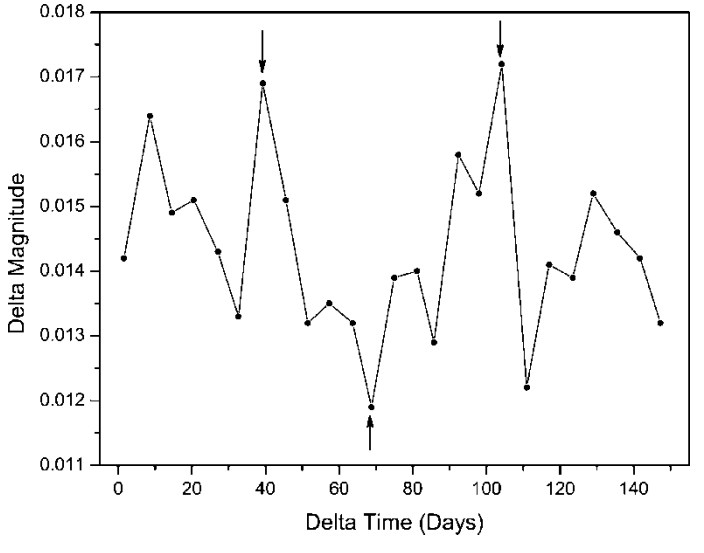

Figure 2. Self-correlation diagram of the Crimean and Hipparcos combined data. A minimum at a lag of $P = 67.385$ days and maxima at lags of $0.5P$ and $1.5P$ are indicated by arrows.

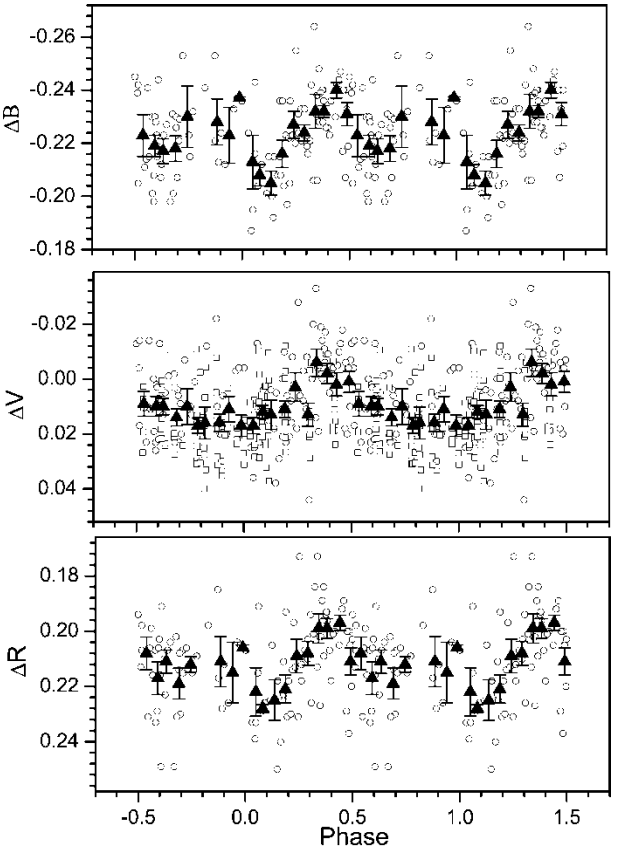

Figure 3. Light curves of HD 192281 relative to the standard star with a period of 67.385 days: ◯, Crimean observations; □, Hipparcos data points transformed to *V* data; ▲, data averaging in bins of 0.05 cycles. The first data point JD 2448176.288 of the author's Crimean observations was arbitrarily set to phase zero.

As is well known, many early supergiants show a long-period variability of light. Perhaps the nature of an origin of this period of optical variability of HD 192281 is due to changes in the continuum flux. The absence of line-profile two-monthly variability in the spectrum of HD 192281 supports these guesses [14]. In order to understand more fully the nature of this variability it is necessary to continue to make highly accurate and long-term observations.

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